

Neck Pain and Arm Symptoms: Summary 1 – General Workup

Evaluation Strategy: work through each of the following clinical issues.

1. Rule out fractures and nonmechanical causes (e.g., organic disease). p. 7
2. Determine if there is true neurological involvement (e.g., radiculopathy, peripheral entrapment, myelopathy, etc). p. 9
3. Identify the pain generator or the cause of the neurological damage and arrive at a pathoanatomical diagnosis. p. 31
4. Identify pain generating biomechanical/functional lesions (e.g., joint dysfunction). p. 35
5. Identify any pain relieving postures or movements (e.g., traction, McKenzie evaluation). p. 36
6. Determine the phase of injury (acute, recurrent, chronic). p. 36
7. Estimate the severity of the condition. p. 38
8. Determine need for imaging or other neurophysiological testing. p. 39
9. Identify any local complicating factors (e.g., functional or mild structural instability, relative stenosis degenerative changes) p. 44
10. Identify yellow flags for psychosocial issues or other predictors of chronicity. p. 45
11. Identify contributing or sustaining factors (e.g., upper cross syndrome, forward head carriage etc.). p. 49
12. Set outcome measures. p. 50
13. Establish a prognosis. p. 52

CLINICAL ISSUE 1: Red Flags for Disease (p. 8)

(Indications for imaging and laboratory tests)

- Prior history of cancer
- Unexplained weight loss, e.g., 10 lbs over 3 months
- Unvarying symptoms, uninfluenced by rest or activity, same during the day or night
- Diffuse “cape-like” distribution of pain/temperature loss over one or both shoulders
- Horner’s syndrome
- Fever/chills
- Recent bacterial infection/ hx of recurrent infections
- Palpable mass
- Pain unimproved with a month of treatment
- Neck pain with urinary retention/incontinence
- Multiple joint involvement
- History of long-term corticosteroid use
- Chronic shoulder pain in smoker over 50-60
- Recent infection + fever + neck stiffness
- Neck/arm pain with neurological deficits in patients over 50-60.
- Neck pain plus nuchal rigidity
- Elevated ESR (See Appendix I) or CRP
- Anemia.

CLINICAL ISSUE 2: Summary of Differential Diagnoses for Arm Symptoms

1. Radicular syndromes (p. 9-19)
2. Myelopathy (p. 19-23)
3. Neural compromise at other peripheral locations (p. 24-27)
4. Somatic referred pain (p. 27-30)
5. Multiple dysfunctions in the kinetic chain of the neck and arm (e.g., cervical joint dysfunction, plus GH dysfunction, plus hypertonic pronator teres. (p. 31)

► **Clinical tip.** Deep referred pain (scleratogenous) is a far more likely cause of neck and arm symptoms than is a radicular syndrome (see pp 21-24).

CLINICAL ISSUE 6: Determine Phase of Injury (p. 36)

Acute. In severe cases, the patient may not be able to initially tolerate a classic orthopedic exam. Early evaluation should emphasize neurological, palpatory, and pain relief assessments. During these periods, investigation of posture, movement patterns, and other contributing factors will also have to be postponed until the patient settles back into his or her more habitual modes of sitting, standing and movement.

Recurrent. Treat acute aspects of individual episode, than approach as if it were a chronic case.

Chronic

- Avoid chasing the pain generator
- Address inefficient biomechanics and weak links in the kinetic chain.
- Address deconditioning.
- Assess psychological burden (see yellow flags)

CLINICAL ISSUE 7: Determine Severity of the Condition

1. Assess global impact on patient
 - Activities of daily living. (e.g., NDI)
 - Pain (mVAS)
2. Assess severity of nerve root/peripheral nerve damage
 - Mild loss: sensory deficit, with or without a loss of one motor grade; with typical improvement in 6-12 weeks.
 - Moderate loss: absence of deep tendon reflex (DTR) with more than one grade of motor loss; typically with complete recovery within 3-6 months; gradual recovery of muscle strength over that time. (a grade 0 DTR will rarely return).
 - Severe loss: motor loss to a Grade 3 or below; with full recovery often taking a year, and occasionally with only partial recovery.

CLINICAL ISSUE 8: Imaging and Advanced Tests

1. Plain film radiography (p. 40)
2. Advanced imaging: MRI/CT (p. 41)
3. Myelography (p. 43)
4. Discography (p. 43)
5. Neurophysiological studies (AKA, electrodiagnosis) (p. 44)

Imaging *strongly indicated* prior conservative care:

- traumatic onset: risk of associated fracture or dislocation, or risk of avulsive injury to nerve (See CSPE protocol, [Imaging: Acute Cervical Spine Injury](#).)
- suspected associated myelopathy
- suspected infection or neoplasm
- suspected or known inflammatory syndromes which could cause structural instability (e.g., RA, AS, etc.)
- severe neurologic deficits or severe, disabling radicular pain upon initial presentation
- based on overall clinical judgment.

Imaging indicated in the course of case management:

- progressive neurological deficits, especially motor deficits
- failure to respond to conservative care within the first few weeks
- inadequate response to conservative care within 2-3 months
- in preparation for a possible surgical consult (the surgeon may wish to the order the imaging modalities)

► **Clinical tip.** *A surgical consultation is indicated if neurologic signs are worsening (especially motor), or if they are positively correlated with degenerative changes or disc herniation and conservative care has failed.*

► **Clinical tip.** *In cases of chronic or non-responsive whiplash, delayed instability may not be detected until dynamic films are repeated weeks or months after the injury due to initial muscle guarding.*

When to order advanced imaging (3 options)

- ⇒ **Low tolerance threshold: radiculopathy.** MRI for those patients with suspected cervical radiculopathy.
- ⇒ **Moderate tolerance: neurological deficits.** MRI patients with neurological deficits
- ⇒ **Higher tolerance.** Advanced imaging should be ordered **1)** a suspicion of myelopathy, **2)** progressive neurological deficit while under care (especially motor), **3)** as part of a presurgical examination, (e.g., arm pain or neurological deficit that does not respond to conservative treatment), **4)** severe radiculopathy.

CLINICAL ISSUE 9: Identify any Local "Complicators" (p. 44)

Degenerative Joint Disease

► **Clinical tip.** *In most situations degenerative disc or joint disease of the cervical spine should not be cited as the patient's primary diagnosis. Rather it can be cited as a local complicator.*

Presentation of osteoarthritis

- painless stiffness with relative sparing of flexion usually indicates osteoarthritis
- may be predisposed by chronic forward head position and cervical hyperextension posture
- intermittent aggravation of aching and stiffness that often is worse with activities that involve neck movement
- symptoms may increase upon waking in the morning or at night from sleep

Other symptoms of OA include

- Pupillary signs
- Dysphagia.
- Ear symptoms (such as tinnitus)
- Facial pain, jaw pain
- Vertigo
- Pseudotumor

Summary of Yellow Flags (p. 45-48)

1. Psychological factors
 - 1.1 Catastrophizing
 - 1.2 Fear avoidance behavior
 - 1.3 Depression and anxiety
 - 1.4 Self-perception of poor health
 - 1.5 Sexual abuse
 - 1.6 Other factors
2. Worker's compensation issues
3. Litigation
4. Job environment
5. Education
6. Cervical nonorganic signs

CLINICAL ISSUE 11: Identify Contributing or Sustaining Factors (p. 49)

Posture (standing and seated)
Upper (proximal) cross syndrome
Functional instability

Upper Cross Syndrome

- Overactive neck extensors (including upper traps, levator scapulae and suboccipital muscles)
- Inhibited/weak deep flexors (including longus capitus, longus colli and scalene muscles)
- Overactive pectoralis
- Inhibited/weak middle and lower trapezius
- Sometimes overactive SCMs

For CLINICAL ISSUE 12, Outcome Measures see p. 50 and "Neck Pain and Arm Symptoms: Summary 3 Somatic Referrals (Outcome Measures)."

Neck Pain and Arm Symptoms: Summary 2 – Nerve Damage

CLINICAL ISSUE 2: Neurological involvement (p. 8-30)

Radicular syndrome (strong suspicion) (p. 9)

Neck pain (include ridge of shoulder and interscapular area), plus any of the following:

- pain radiating into the forearm or hand (especially dermatomal),
- paresthesia to the fingers (especially dermatomal),
- neurological symptoms (subjective numbness, reported weakness).

Radicular syndrome (weaker suspicion)

- interscapular pain,
- pain radiating past the GH joint but not past the elbow
- moderate to severe trauma to the neck,
- neck and leg symptoms (suggests spinal cord injury; so concomitant nerve root injury must be ruled out),
- suspected diagnosis which has the potential to affect nerve roots (e.g., stenosis, tumor)

Radicular syndromes (p. 6-18)

The Arm Pain Classic” Characteristics

- lancinating or shooting quality
- radiating into the extremity in a narrow band less than two inches wide
- often exceeds the intensity of the neck pain
- dermatomal
- easily aggravated by minor movements, coughing, or sneezing.

The Paresthesia

Radicular symptoms are characterized by proximal pain and distal paresthesia in the distribution of the affected nerve root.

Radicular pain patterns (p. 12-16)

1. Symptoms respond to closing or opening of the IVF.
2. Symptoms respond to increasing or decreasing nerve root tension
3. No discernible pattern

Radicular syndrome orthopedic tests (p. 16-18)

- cervical compression/ lateral flexion + compression/ maximum compression
- cervical distraction
- Valsalva maneuver
- upper limb tension test (ULTT)
- shoulder abduction
- brachial compression test/door bell sign/Tinel's sign

Radicular syndrome neurological exam

- sensory testing (light touch, sharp, vibration)
- DTRs (biceps, brachioradialis, triceps)
- manual muscle test (optional: sustained/repetitive)
- measure for atrophy of upper arm and forearm
- dynamometer/pinch gauge (optional)

If radiculopathy is present, test for myelopathy (p. 19-23).

► **Clinical tip.** In patients with suspected or established neurological involvement, the basic neurological exam should be repeated often to increase its sensitivity and to watch for any deterioration.

► **Clinical tip.** Any light touch or pain (sharp vs dull) deficits should be carefully mapped.

► **Clinical tip.** Equivocal reflexes may need to be checked over several visits.

► **Clinical tip.** Motor deficits should always be carefully tracked throughout the course of treatment. Progressive motor weakness while under care prompts further evaluation and a surgical consultation.

► **Clinical tip.** It is important to chart repetitive or sustained muscles testing: For example, “grade 3/5 weakness at 3seconds” or “grade 3/5 weakness at 7 reps.”

Most common roots: C6 or C7

- C6 root pain: anterior or posterior deltoid, posterolateral arm, dorsal radial forearm, the dorsal radial side of the hand, back of the thumb and index finger. More rarely, the back of the ulnar side of the hand, and/or dorsal 4th or 5th fingers.
- Pain in the suprascapular region suggests C5 or C6. Additional pain in the lateral aspect of the arm and forearm leans toward C6.
- If symptoms are in multiple fingers, suspect C6 if the most severe involvement is in the thumb.
- In general, biceps is weaker than deltoid in C6.
- Positive likelihood ratios of deficits for C6
 - 14.5 Decreased biceps or brachioradialis reflex
 - 8.5 Sensory loss over the thumb
 - 2.3 Weak wrist extension

C7 nerve root

- Pain in the scapular or interscapular region suggests a C7 or C8.
- Pain in the posterior deltoid, posterolateral arm and even the dorsal radial hand can be from C7 or C6.
- If multiple fingers are involved, consider C7 index finger is the worse.
- The triceps tendon reflex diminishes in either C7 or C8, but will mostly likely be C7.
- Positive likelihood ratios of deficits for C7:
 - 28.3 Decreased triceps reflex (C7 or C8)
 - 4.0 Weak elbow extension
 - 2.3 Sensory loss over middle finger

See a nerve root chart Appendix III.

CLINICAL ISSUE 3: Identify the Cause (diagnosis) of Neurological Damage (p. 31-35)

Differential Diagnoses for a Radicular Syndrome

1. disc herniation (**most common**)
2. spondylotic compression (**most common**)
3. stenosis
4. traction injuries (whiplash, "burners")
5. root adhesions/fibrosis
6. tumors
7. fracture
8. instability
9. infection (of bone, disc, meninges near root)
10. "chemical irritation" of nerve root

Disc Herniation. The presence of any of the following would further strengthen the clinical suspicion of a disc herniation (based on conventional wisdom and some research evidence):

- Neck pain and decreased active AROM
- Arm pain centralizes with repetitive or sustained neck positioning (AKA, McKenzie evaluation)
- Bakody's sign or positive shoulder abduction test
- Positive Valsalva (also positive with tumors)
- Positive cervical compression/distraction tests (may also be positive with spondylotic compression)
- Decreased biceps reflex (or other deficits)
- No evidence of significant osteophytes or spurring around the IVF on radiograph.

➤ **Special note:** Consult Appendix V for the exact format for writing a cervical disc herniation diagnosis in WSCC clinics.

Spondylotic compression/stenosis. Consider as the first differential in older patients especially in the absence of more compelling evidence for a competing diagnosis.

Findings that would cast doubt on this diagnosis

- Little evidence of degenerative changes on a radiograph. (Radiographic assessment is required.)
- Arm pain centralizes with repetitive or sustained neck positioning (AKA, McKenzie evaluation); this is more suggestive of a herniated or deranged disc.
- Bakody's sign or positive shoulder abduction test is more suggestive of a disc herniation.
- Positive Valsalva maneuver is more suggestive of a disc herniation or tumor.

➤ **Clinical tip for treating patients with nerve root/peripheral nerve adhesions:** Patients who experience an increase in pain from the stretching of fibrotic tissues need to be told that this pain is associated with the desired therapeutic outcome.

Differential Diagnoses for a Myelopathic Syndrome

1. disc herniation (most common cause)
2. spinal canal stenosis (most common cause)
3. tumors
4. instability

5. neurapraxis injury
6. fracture
7. cord/meningeal adhesions/fibrosis
8. infection (of bone, disc, meninges near root)

➤ **Clinical tip.** Patients with a suspected radicular syndrome must be evaluated for signs and symptoms of myelopathy.

Neurological Exam for Cord Lesions (pp. 21-23)

Add to the basic neural exam for radiculopathy:

Neck flexion (L'hermitte's sign)

Cranial nerve exam (if there are cord signs present)

Upper extremity

- observe intrinsic muscles of the hand
- finger escape sign
- rapid hand opening and closing
- Hoffman (dynamic)
- scapulothoracic reflex

Lower extremity

- gait/tandem Romberg
- lower extremity strength
- DTRs
- Babinski/clonus
- position sense
- sharp-dull
- vibration
- run in place/one leg stand (eyes closed) (see Appendix IV)

Summary of common causes of neurological compromise at other locations

- 3.1 brachial plexus injuries (p. 24)
- 3.2 thoracic outlet syndromes (TOS) (p. 24)
- 3.3 peripheral nerve adhesions/ entrapments/ injuries (e.g., radial nerve palsy) (p. 26)
- 3.4 complex regional pain syndrome (AKA, RSDS) (p. 27)

TOS: Summary of physical examination (p. 24-26)

- Postural analysis (standing and sitting)
- Palpation of the scalenes, pectoralis and other cervical and shoulder girdle muscles
- Neurological evaluation (e.g., DTRs, muscle tests, and sensory testing)
- Vascular evaluation (check upper extremity pulses, nail blanching, temperature, swelling, auscultation for bruit, Allen's test)
- TOS tests (Roo's, hyperabduction, etc.)
- Focal stress tests over scalenes and upper portion of pec minor
- Length testing of pecs and scalene muscles
- Static and motion palpation of cervical and thoracic spine, ribs, AC and SC joints.
- Evaluate breathing pattern

There are five main types of symptoms: pain, autonomic dysfunction, edema, movement disorder, and dystrophy/atrophy. (p. 27)

Neck Pain and Arm Symptoms: Summary 3

Somatic Referral (and Outcome Measures)

Deep referred syndromes

- 4.1 facet syndrome (p. 28)
- 4.2 internal disc derangement (p. 28)
- 4.3 subluxation syndromes (pp. 29 & 35)
- 4.4 myofascial pain syndromes (p. 30)

High pay-off areas to screen for myofascial and joint dysfunction include

- the upper cervical spine (including the occiput and suboccipital muscles)
- the lower cervical spine
- the upper thoracic joints and ribs
- muscles originating from the shoulder girdle (including the SCM, the scalenes, levator scapula and upper trapezius).

Facet Syndrome: physical findings (p. 28)

Palpatory (perhaps the best evidence)

- Tenderness over the facet
- Tissue changes around the joint (e.g., spasm)
- Joint restriction

Joint loading (may be less accurate)

- Local pain with active or passive extension
- Local pain with cervical compression (neutral or maximum)
- Local pain in the quadrant position (combined extension, rotation and lateral flexion to the same side) or during cervical
- “Kemp’s” test

Disc Derangement: clinical presentation (p. 29)

- Neck pain with or without referred pain
- Self-limiting episodes in younger people of acute torticollis
- Intermittent scapular pain
- May co-exist with facet syndrome
- May be aggravated by cervical compression
- Less likely to have tenderness localized just over the facets (conventional wisdom)
- Somatic referred pain into the arm may be improved by repetitive movements into chin retraction, neck extension, or some other direction (e.g., McKenzie protocol)
- Often very difficult to differentiate from facet syndrome

Cervicodorsal referral (p. 29)

- reproduction of the dorsal pain with head rotation to the symptomatic side (sometimes requiring some additional extension while rotated)
- sometimes a positive doorbell sign
- palpable joint dysfunction in the lower cervicals
- symptom relief with cervical manipulation.

Concomitant findings may also include a tender point about 2 cm lateral to the spinous process of T5 or T6.

Joint dysfunction/ subluxation syndromes (Generally, practitioners look for two or more of the following to be present.)

- Altered motion by palpation (loss of joint play, reduced palpable segmental range of motion, altered end feel, hypermobility)
- Tenderness or dysesthesia elicited by static or motion palpation
- Palpable spasm or change in tissue texture near joints (e.g., positive skin rolling, temperature change, visible tissue changes)
- Reduction of tenderness with joint challenge
- Palpable malposition (e.g., “prominent” articular facet, deviated SP, prominent transverse tip of atlas)

Myofascial Pain Syndromes (MFTP)

- **Clinical tip.** *Vernon suggests that in some cases, MFTPs can co-exist with radicular syndromes and may need to be addressed.*
- **Clinical tip.** *A sensitive spot in a muscle that refers pain does not alone identify an MFTP.*

Essential criteria for MFTPs

- Pressure on the trigger point reproduces the patient’s pain and the patient *recognizes* the tenderness as the same pain they are complaining of.
- Painful limitation to full stretch of the muscle.

Confirmatory observations for MFTPs

- Local twitch sign (seen or felt)—sensitivity is thought (based on expert opinion) to be poor, but specificity is very high.
- Referred pain or altered sensation in an area that the patient recognizes as reproducing the symptoms that he or she presented with (thought to be a very useful confirmation).
- Pain or altered sensation in an expected referral pattern that the patient doesn’t recognize may suggest a more latent trigger point.
- Electromyographic evidence of spontaneous electrical activity is present in the area of a tender nodule within a taut band.

Note: The muscle harboring the trigger point may also be weak.

Further evaluation of patients with MFTPs

1. Other muscles within the same functional unit should be evaluated for dysfunction (e.g., weakness or muscles that are short and tight), such as assessing the entire rotator cuff group in the case of an infraspinatus myofascial pain syndrome;
2. Identify activities that may have led to the development of the syndrome;
3. Identify any other structural or functional causes that may result in *persistence* of the trigger points, such as chest breathing (especially in patients with scalene trigger points), leg length inequality, pelvic distortions, etc.

► **Clinical tip.** *In addition to the possibility of a patient's arm symptoms radiating from trigger points located in the neck and shoulder muscles, a patient may actually have two separate lesions-- e.g., a cervical facet syndrome responsible for the neck pain and pronator teres trigger points resulting in forearm and hand symptoms.*

Multiple Joint Lesions Along the Kinetic Chain (p. 31)

- First and second rib
- Acromioclavicular (AC) and sternoclavicular joint (SC)
- Glenohumeral joint
- Elbow joint
- Carpal bones, distal radial-ulnar joint

► **Clinical tip.** *When tenderness is found within the territory of the patient's radiating pain or paresthesia, the practitioner must consider still another explanation. The hyperalgesia may actually be secondary to nerve root irritation or, in the case of somatic referred territories, due to central sensitization at the cord level.*

CLINICAL ISSUE 12: Outcome Measures (p. 50)

► **Clinical tip.** *It is helpful to utilize outcome measures for all three goals whenever possible. The most useful is generally considered to be monitoring effects on activities of daily living, work or recreation.*

GOAL: Decrease effect of neck problem on ADL's/ work/ recreation

- Neck Disability Index
- DASH questionnaire
- pain severity (mVAS) while performing a specific activity.
- ability (measured by frequency or duration) to perform a specific activity.
- Observe repetitions of a specific activity (track number of repetitions/degree of pain/quality of movement).

GOAL: Symptom relief

DECREASE pain

- m-VAS (required).
- analgesics (dosage and frequency).
- McGill pain questionnaire.

DECREASE TERRITORY of pain

- Pain centralization (patient report or pain diagram).

DECREASE DURATION OF SYMPTOMS

- Percentage of the day that the patient is symptomatic (by patient recall or diary).
- Length and/or the number of symptom-free periods (by patient recall or diary).

DECREASE RECURRENCE RATE of symptoms or RECURRENCE RATE of peak intensity

- Frequency, duration of episodes/peak intensity (by patient recall or diary).
- Length, number of symptom-free periods (by patient recall or diary).

GOAL: Improve physiologic measurements

IMPROVE cervical AROM

- Use inclinometer or visual estimate. See Appendix IX.

IMPROVE DEEP FLEXOR STRENGTH

- The neck flexion test (Janda) can be used to assess endurance or speed of contraction; can be used with blood pressure cuff.
- Use the cervical instability test (Jull test) (hold for 4-10 seconds)

IMPROVE STRENGTH/ENDURANCE OF LARGE TORQUE PRODUCERS. See Appendix X.

IMPROVE GRIP STRENGTH

- Jamar [dynamometer](#) (see CSPE protocol).
- Number of grip repetitions of a standardized object (e.g., squeezing a balloon filled with flour, a hand ball, etc.).

INCREASE DEEP FLEXOR CONTRACTION SPEED

- Jull test with quick release (pass/fail).
- Response to wobble board push (pass/fail based on being able to maintain a chin tuck).