College of Registered Nurses of Saskatchewan

Low Back Pain: Adult & Pediatric

Musculoskeletal

Clinical Decision Tools for RNs with Additional Authorized Practice [RN(AAP)s]

Effective Date: February 1, 2022

Background

Acute mechanical low back pain (LBP) is an injury to the paravertebral spinal muscles characterized by the presence of pain between the costal angles and gluteal folds that may radiate down one or both legs (sciatica) (Dunphy, Winland-Brown, Porter, & Thomas, 2019). Structures that can be a source of pain are muscles, ligaments, vertebral bones, facet joints, intervertebral disks, and nerve roots (Dunphy et al., 2019). Acute LBP is almost always benign and generally resolves within one to six weeks (Accelerating Change Transformation Team, 2015). Potential causes of acute LBP are contusions, ligamentous strain, muscular strain, muscular tension related to mechanical stress, osteoarthritis of the spine, and protruding intervertebral disk (Dunphy et al., 2019). However, localizing an injury to a specific structure is almost impossible due to the deep location of the lumbar soft tissues (Dunphy et al., 2019).

Immediate Consultation Requirements

The RN(AAP) should seek immediate consultation from a physician/NP when any of the following circumstances exist:

- possible fracture from major trauma (e.g., motor vehicle crash) or minor trauma in older clients, clients who may have osteoporosis, and/or those who are on chronic corticosteroids;
- abdominal pulsatile mass with pain (abdominal aortic aneurysm);
- possible cauda equina syndrome (surgical emergency), usually due to a tumor or a large disk herniation, and may present with:
  - saddle anesthesia (e.g., loss of sensation in the perineal area);
  - bladder dysfunction;
  - bowel dysfunction;
  - severe or progressive neurologic dysfunction in the legs;
  - laxity of anal sphincter;
  - major motor weakness in quadriceps (knee extensors), ankle plantar flexors, evertors and dorsiflexors (foot drop);

  - bilateral sciatica
- possible tumor or infection, risk factors include:
  - client < 18 or > 50 years of age; cancer (known or unknown);
  - constitutional symptoms such as fever, chills, and/or unexplained weight loss;
  - risk factors for spinal infection (e.g., recent bacterial infection, injection drug use, indwelling catheter, or immunosuppression);
  - pain that is worse in the supine position or severe night time pain;
  - pain that has not improved after one month of treatment;
  - acute neurologic deficits (potentially spinal cord compression) that progress or are severe.
- possible herniated nucleus pulposus:
  - straight leg raise positive at < 60 degrees (shooting leg pain must be elicited),
  - weak dorsiflexion of ankle or great toe,
  - decreased ankle reflex,
  - decreased light touch in dermatomes of foot/leg (L4, L5, S1) (Interprofessional Advisory Group [IPAG], personal communication, October 14, 2019; Accelerating Change Transformation Team, 2015; RxFiles Academic Detailing Program, 2021).

Predisposing and Risk Factors

Development of acute LBP may be influenced by:

- female gender,
- smoking,
- obesity,
- aging,
- physically strenuous work,
- prolonged periods of standing or sitting,
- poor posture,
- pregnancy,
- improper lifting techniques,
- family history,
- osteoporosis,
- past trauma,
- psychological conditions (e.g., anxiety), or
- repetitive activities involving the low back (e.g., snow shoveling) (Dunphy et al., 2019; Wheeler, Wipf, Staiger, Deyo, & Jarvik, 2019).

Health History and Physical Exam

Subjective Findings

The review of systems is essential and may alert the provider to possible "red flags" or symptoms consistent with those identified in the *Immediate Consultation Requirements* section (Dunphy et al., 2019). In addition to assessment of physical symptoms, perform a brief psychosocial assessment to determine chronicity risk factors including depression, passive coping strategies, job

dissatisfaction, higher disability levels, disputed compensation claims, somatization, and catastrophization (Accelerating Change Transformation Team, 2015).

The circumstances of the presenting complaint should be determined. The health history should include:

- mode of onset (abrupt or insidious) and whether the pain is constant or intermittent;
- effects of activities (such as posture, coughing, sneezing, straining, exercise, rest, and sleep); and
- if the pain is back dominant, or leg dominant;
- sensory changes (numbness, tingling, pins and needles);
- changes to/or loss of bladder or bowel function;
- aggravating and relieving factors;
- the level of disability:
- no limitations,
- mild limitations - able to do most activities with minor modifications,
- moderate limitations - able to do most activities with modification,
- severe limitations - unable to perform most activities.
- previous back pain history, treatments and surgeries; and
- about other underlying spinal, disk, bone, or joint disease (e.g., spinal stenosis, osteoarthritis) (Dunphy et al., 2019; Government of Saskatchewan, 2015a).

Objective Findings

Exam should progress from tests done standing to tests done kneeling, then to those done sitting (first on a chair and then on the examining table), and finally lying down, supine and prone.

The physical exam should include:

- general appearance, client may appear in mild to severe distress;
- inspection of back and posture;
- assessment of range of motion to determine if pain elicited and with which movement, flexion, or extension;
- palpation of the spine, and paravertebral muscles for tenderness;
- neurologic examination to assess low motor function:
  - saddle sensation,
  - rectal exam if saddle sensation abnormal or loss of bladder/bowel control as an abnormal result suggests possible cauda equina syndrome.
- reflex (conductive) tests (e.g., deep tendon reflexes):
  - patellar reflex (L4),
  - achilles reflex (S1).
- plantar response: extensor (Babinski reflex) response is abnormal in clients over the age of two, so this finding demands a more detailed neurological workup as it negates the diagnosis of acute LBP due to mechanical causes;
- motor (conductive) tests: (refer to the Performing Motor Conduction Tests chart below)

  - ankle dorsiflexion (L5),
  - hip abductor (L5),
  - extensor hallucis longus (L5),
  - flexor hallucis longus (S1),
  - gluteus maximus (S1).
- irritative tests:
  - bilateral straight leg raises: test for radicular pain arising from nerve root irritation (L4-S2) and is positive only in clients with leg-dominant pain and if it recreates the leg pain,
  - bilateral femoral stretch test: extension of the hip with the client in a prone position; anterior thigh (L2–3) or medial leg (L4) pain indicates disc herniation at these levels.

Direct nerve root irritation is uncommon but, when it occurs, 90% involves L4, L5, or S1 (including L3, the percentage increases to nearly 96%) so the neurological tests emphasize these levels. With back-dominant referred pain, one type of test for each nerve is generally sufficient. Intermittent back-dominant pain eliminates malignancy and active infection as causes of the pain. Normal upper motor tests rule out a cord lesion as the source of the symptoms. Unchanged bowel and bladder function, normal saddle sensation, and no crossover on straight leg raise remove the possibility of cauda equina syndrome (Accelerating Change Transformation Team, 2015).

Throughout the exam, the RN(AAP) should evaluate for symptoms consistent with those identified in the *Immediate Consultation Requirements* section (Dunphy et al., 2019; Government of Saskatchewan, 2015a; Wheeler et al., 2019).

Performing Motor Conduction Tests

Test	How to Perform	Findings
Ankle dorsiflexion (L5)	The client walks on heels only while avoiding contacting the floor with the forefeet, using the examiner's hands for balance as needed.	Inability to maintain the forefoot off the ground is a positive result.
Extensor Hallucis Longus (L5)	The client fully dorsiflexes the great toe and maintains this position as the examiner applies a plantar flexion force.	Weakness or inability to maintain dorsiflexion of the great toe is a positive finding.
Flexor Hallucis Longus (S1)	The client stands on one foot while flexing the contralateral knee, while holding the examiner's hands or a countertop for balance. The client plantar-flexes the ankle, raising the heel of the supporting limb off the floor to maximal plantar-flexion.	Inability to perform 10 successive heel raises is a positive result.

Test	How to Perform	Findings
Gluteus Maximus (S1)	Client performs lateral rotation of the upper leg and extension of the thigh at the hip.	Impairment would reveal difficulty lifting out the leg to the side, making the thigh extend straight at the hip and twisting the thigh away from the centre of the body.
Hip Abductor (L5)	The client is positioned in side-lying with the asymptomatic limb against the table surface and the symptomatic thigh abducted to 30° from horizontal. The client maintains the abducted position as the examiner applies an adduction force. While standing, have the client take a step. During the step, instead of the pelvis being raised on the side of the lifted foot, it drops. Thus it is seen as the client's pelvis tilting towards the lifted foot, with much flexion needed at the knee on the affected side in order for the foot to clear the ground. Note that the lesion is on the contralateral side to the sagging hip.	Weakness may contribute to lumbar pain due to abnormal segmental movement of the lumbar spine if the pelvis is not stable during gait or standing.

(Stanford Medicine, 2019)

Differential Diagnosis

The differential diagnosis of acute LBP includes mechanical LBP, conditions intrinsic to the spine (e.g., compression fracture), systemic conditions (e.g., cancer), and conditions causing referred pain (e.g., abdominal aortic aneurysm). More than 90% of those with LBP have benign mechanical problems and their pain can be classified into four distinct patterns: two back-dominant patterns and two leg-dominant patterns (Government of Saskatchewan, 2015b). Refer to the following tables for detailed information of differential diagnoses.

Mechanical Back Pain
Pattern 1 - Back Dominant Pain aggravated by flexion, and: • the pain may be constant or intermittent, felt most intensely in the back, buttock, over the trochanter, or in the groin; • it is always present during anteflexion (Pattern 1) and may be present during dorsiflexion (Pattern 1 or resistant); and • the neurological exam is normal or non-contributory.

Pattern 2 - Back Dominant Pain aggravated by extension, and:

- the pain is always intermittent, and felt most intensely in the back, buttock, over the trochanter, or in the groin;
- it is never intensified with flexion; and
- the neurological exam is normal or non-contributory.

Pattern 3 - Constant Leg Dominant Pain, and:

- the pain is constant and felt most intensely below the gluteal fold above or below the knee, and
- the neurological exam must be positive for either an irritative test or a newly acquired focal conduction deficit.

Pattern 4 - Intermittent Leg Dominant Pain aggravated by activity, and:

- the pain is always intermittent, felt most intensely below the gluteal fold above or below the knee, and is brought on by activity and relieved by rest in flexion;
- the neurological exam is negative with client at rest

(Government of Saskatchewan, 2015b)

Spinal Causes of Lower Back Pain

Compression fracture:

- History of trauma (unless osteoporotic), point tenderness at spine level, pain worsens with flexion and while pulling up from a supine to sitting position, and from a sitting to standing position.

Herniated nucleus pulposus:

- Leg pain is greater than back pain and worsens when sitting; pain from L1-L3 nerve roots radiates to hip and/or anterior thigh, pain from L4-S1 nerve roots radiates to below the knee.

Spinal stenosis:

- Leg pain is greater than back pain; pain worsens with standing and walking and improves with rest or when the spine is flexed; pain may be unilateral (foraminal stenosis) or bilateral (central or bilateral foraminal stenosis).

Spondylolisthesis:

- Leg pain is greater than back pain; pain worsens with standing and walking and improves with rest or when the spine is flexed; pain may be unilateral or bilateral.

Spondylolysis:

- Can cause back pain in adolescents, although it is unclear whether it causes back pain in adults; pain worsens with spine extension and activity.

Spondylosis (degenerative disk or facet joint arthropathy):

- Similar to lumbar strain; disk pain often worsens with flexion activity or sitting, facet pain often worsens with extension activity, standing, or walking.

Systemic Causes of Lower Back Pain

Connective tissue disease: • Multiple joint arthralgias, fever, weight loss, fatigue, spinous process tenderness, other joint tenderness.
Inflammatory spondyloarthropathy: • Intermittent pain at night, morning pain and stiffness, inability to reverse from lumbar lordosis to lumbar flexion.
Malignancy: • Pain worsens in prone position, spinous process tenderness, recent weight loss, fatigue.
Vertebral discitis/osteomyelitis: • Constant pain, spinous process tenderness, often no fever, normal complete blood count, elevated erythrocyte sedimentation rate and/or C-reactive protein level.
Referred Pain
Abdominal aortic aneurysm: • Abdominal discomfort with a pulsatile abdominal mass.
Gastrointestinal conditions (e.g., pancreatitis, peptic ulcer disease, cholecystitis): • Abdominal discomfort, nausea/vomiting, symptoms often associated with eating.
Herpes zoster: • Unilateral dermatomal pain, often allodynia, and a vesicular rash.
Pelvic conditions (e.g., endometriosis, pelvic inflammatory disease, prostatitis): • Discomfort in the lower abdomen, pelvis, or hip.
Retroperitoneal conditions (e.g., renal colic, pyelonephritis): • Costovertebral angle pain, abnormal urinalysis results, possible fever.

(Dunphy et al., 2019)

Making the Diagnosis

The diagnosis of acute LBP is usually made clinically based on the health history and physical exam demonstrating localized pain, muscle spasm, and a normal neurologic exam (Dunphy et al., 2019; Accelerating Change Transformation Team, 2015). In the absence of "red flags", laboratory tests are not recommended (Accelerating Change Transformation Team, 2015).

Investigations and Diagnostic Tests

In the absence of any symptoms consistent with those identified in the *Immediate Consultation Requirements* section, no investigations are needed within the first four weeks of acute LBP (Institute of Health Economics, 2015).

Referral to a physician/NP for evaluation of clients using MRI (preferred) or CT should be

considered if the client has persistent LBP after four weeks and/or signs or symptoms of radiculopathy or spinal stenosis (Accelerating Change Transformation Team, 2015).

Management and Interventions

Goals of Treatment

The primary goals of immediate treatment are to relieve pain, prevent further injury, prevent or reduce work absence, educate and reassure the client, and prevent chronicity (Dunphy et al., 2019; Accelerating Change Transformation Team, 2015). *The Primary Care Provider Treatment Algorithms* developed by the Saskatchewan Spine Pathway (2015b) provide guidance regarding initial management.

Non-Pharmacological Interventions

The RN(AAP) should recommend, as appropriate, the following non-pharmacological options:

- use of a heating pad or hot water bottle may reduce muscle stiffness, pain, and spasm;
- provide advice about nutrition and weight loss if the client is overweight;
- use of lumbar supports or shoe insoles/orthoses;
- spinal manipulation (chiropractic);
- intensive interdisciplinary rehabilitation;
- physiotherapy guided exercise program;
- acupuncture;
- massage therapy;
- yoga;
- cognitive behavioral therapy; and/or
- progressive relaxation for chronic or subacute LBP (Dunphy et al., 2019; Accelerating Change Transformation Team, 2015).

Pharmacological Interventions

The pharmacological interventions recommended for the treatment of acute LBP are in accordance with the *RxFiles: Drug Comparison Charts* (RxFiles Academic Detailing Program, 2021).

Analgesics

Over the counter analgesics are usually sufficient to manage low back pain. RN(AAP)s should optimize pain management and prescribe a non-steroidal anti-inflammatory drug and acetaminophen, keeping in mind that administering two NSAIDs simultaneously is not appropriate.

	Drug	Dose	Route	Frequency	Duration
Pediatric					
	Ibuprofen (preferred)	5-10 mg/kg/dose (maximum dose 40 mg/kg/day)	p.o.	q6-8h	regularly for 1-3 days and then prn
AND/ OR	Acetaminophen	10-15 mg/kg/dose (maximum dose 75 mg/kg/day)	p.o.	q4-6h prn	regularly for 1-3 days and then prn
Adult					
	Ibuprofen (preferred)	600-800 mg (maximum dose of 3200 mg/day)	p.o.	q8h	regularly for 1-3 days and then prn
OR	Naproxen (preferred)	375-500 mg	p.o.	b.i.d.	regularly for 1-3 days and then prn
AND/ OR	Acetaminophen	500-1000 mg (maximum dose of 4 g/day)	p.o.	q.i.d. prn	regularly for 1-3 days and then prn

Muscle Relaxants

Non-benzodiazepine muscle relaxants may be beneficial in the treatment of acute LBP. Most pain reduction from these medications occurs in the first seven to 14 days and is thought to be related to their sedative properties.

	Drug	Dose	Route	Frequency	Duration
Adult					
	Cyclobenzaprine	5-10 mg	p.o.	t.i.d.	regularly for 1-3 days and then prn

Client and Caregiver Education

The RN(AAP) provides client and caregiver education as follows:

- Counsel about appropriate use of medications (dose, frequency, compliance, etc.).
- Educate about symptoms of neurological deterioration that require immediate assessment.
- Educate about the importance of maintaining activity levels and to refrain from bed rest unless there is a period of severe symptoms.
- Advise to avoid prolonged standing or sitting, lifting > 11 kg (25 pounds), and lifting and twisting motions.
- Advise on return to productive function at home and work (even if the pain is not completely resolved) (Dunphy et al., 2019; Accelerating Change Transformation Team, 2015; Rx Files, 2021).

Monitoring and Follow-Up

The RN(AAP) should arrange for the client to follow-up in one to two days, and then every two weeks until recovery.

Complications

The following complications may be associated with LBP:

- chronic or recurrent back pain,
- absenteeism from work,
- dependency on or abuse of opioid analgesics, and
- occupational disability (Dunphy et al., 2019).

Referral

Refer to a physician/NP if client presentation is consistent with those identified in the *Immediate Consultation Requirements* section; or if there is a failure to respond to the prescribed treatment after six weeks, or sooner if symptoms are worsening despite conservative treatment (Dunphy et al., 2019; IPAG, personal communication, October 14, 2019; Accelerating Change Transformation Team, 2015).

References

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